AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. Contract ID Code	Page	Of
Cost Contract	1	9

2. Amendment/Modification No.	3. Effective Date	4. Requisition/Purchase Req No.	5. Project No. (If applicable)
P00002	2003DEC18	SEE SCHEDULE	

6. Issued By Code W56HZV

TACOM WARREN BLDG 231
AMSTA-AQ-ABGA
KATHY LAMBERT (586)574-7634
WARREN, MICHIGAN 48397-5000
HTTP://CONTRACTING.TACOM.ARMY.MIL
EMAIL: LAMBERTK@TACOM.ARMY.MIL

7. Administered By (If other than Item 6) Code N62880

OFFICE OF NAVAL RESEARCH
CHICAGO REGIONAL OFFICE
230 SOUTH DEARBORN STREET, ROOM 380
CHICAGO, IL 60605-1595

SCD C **PAS** NONE **ADP PT** N62880

8. Name And Address Of Contractor (No., Street, City, County, State and Zip Code)

OAKLAND UNIVERSITY
OFFICE OF THE CONTROLLER
110 NORTH FOUNDATION HALL
ROCHESTER, MI. 48309-4401

TYPE BUSINESS: Other Educational

Code 5K597 **Facility Code**

☐ **9A. Amendment Of Solicitation No.**

9B. Dated (See Item 11)

☒ **10A. Modification Of Contract/Order No.**
DAAE07-03-C-L110

10B. Dated (See Item 13)
2003MAY30

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ **The above numbered solicitation is amended as set forth in item 14. The hour and date specified for receipt of Offers**
☐ **is extended,** ☐ **is not extended.**

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing items 8 and 15, and returning _____ copies of the amendments: (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. Accounting And Appropriation Data (If required)
ACRN: AB NET INCREASE: $890,000.00

13. THIS ITEM ONLY APPLIES TO MODIFICATIONS OF CONTRACTS/ORDERS
It Modifies The Contract/Order No. As Described In Item 14.

KIND MOD CODE: A

☒ **A. This Change Order is Issued Pursuant To:** Changes Clause, 52.243-2 **The Changes Set Forth In Item 14 Are Made In The Contract/Order No. In Item 10A.**

☐ **B. The Above Numbered Contract/Order Is Modified To Reflect The Administrative Changes (such as changes in paying office, appropriation data, etc.) Set Forth In Item 14, Pursuant To The Authority of FAR 43.103(b).**

☐ **C. This Supplemental Agreement Is Entered Into Pursuant To Authority Of:**

☐ **D. Other (Specify type of modification and authority)**

E. IMPORTANT: Contractor ☐ **is not,** ☒ **is required to sign this document and return _____ copies to the Issuing Office.**

14. Description Of Amendment/Modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

SEE SECOND PAGE FOR DESCRIPTION

Except as provided herein, all terms and conditions of the document referenced in item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. Name And Title Of Signer (Type or print)		16A. Name And Title Of Contracting Officer (Type or print)	
		DEREK MCALEER MCALEERD@TACOM.ARMY.MIL (586)574-7197	
15B. Contractor/Offeror	**15C. Date Signed**	**16B. United States Of America**	**16C. Date Signed**
_____ **(Signature of person authorized to sign)**		**By** /SIGNED/ **(Signature of Contracting Officer)**	2003DEC18

SECTION A - SUPPLEMENTAL INFORMATION

PURPOSE OF THIS MODIFICATION: Modify the contract to incorporate Changes to the Scope of Work and Delivery Schedule

PREVIOUS CONTRACT:	$1,040,000.00
AMOUNT OF THIS ACTION:	890,000.00
CURRENT CONTRACT AMOUNT:	$1,930,000.00

1. This Modification P00002 is a bilateral modification.

2. The purpose of this modification is to incorporate revisions to the the Scope of Work in accordance with the Changes--Cost Reimbursement (ALT V), Aug 1987 clause included in Section I the contract and make corresponding changes to the period of performance to allow for full performance of the revised scope.

SECTION	DESCRIPTION
B	Make Changes to the Total Estimated Cost of CLIN 0001 to incorporate the changes. Add subCLIN 0001AB to provide funding for the changed scope.
C	Revise the Scope of Work to incorporate applicable changes. Specifically, added paragraphs C.2.1.1, C.2.6.1, C.4.5-C.4.9, C.6.5-C.6.8, C.7.4. Also changed paragraphs C.8.3, C.8.4 and C.9.2.
F	Revise the Period of Performance in paragraph F.1.1 to allow completion of the changed scope
G	Incorporate Accounting and Appropriation Data for the changed scope.

3. As a result of this modification P00002, the total amount of the contract is increased by $890,000 from $1,040,000 to $1,930,000.

4. All other terms and conditions of the contract remain unchanged and in full force and effect.

*** END OF NARRATIVE A 001 ***

Name of Offeror or Contractor: OAKLAND UNIVERSITY

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	SECTION B - SUPPLIES OR SERVICES AND PRICES/COSTS				
0001	SERVICES LINE ITEM SECURITY CLASS: Unclassified				
0001	Supplies or Services and Prices/Costs SERVICES LINE ITEM SECURITY CLASS: Unclassified Contractor shall furnish all the supplies and services to accomplish the task specified in Section C, Scope of Work for the Fastening And Joining Research Institute (FAJRI) Est. Cost: $1,930,000 Total Est. Cost: $1,930,000 Completion Date: l5 Feb 06 INSPECTION/ACCEPTANCE: DESTINATION FOB: DESTINATION (End of narrative B001)				
0001AA	SERVICES LINE ITEM NOUN: 4RHC FASTENING&JOINING RESEAR PRON: E132C354EH PRON AMD: 01 ACRN: AA AMS CD: 622601T2811 Inspection and Acceptance INSPECTION: Destination ACCEPTANCE: Destination				$ 1,040,000.00
0001AB	SERVICES LINE ITEM NOUN: 4RHC OSD OAKLAND UNIV FASTEN PRON: E132C501EH PRON AMD: 01 ACRN: AB AMS CD: 10601103D8Z Inspection and Acceptance INSPECTION: Destination ACCEPTANCE: Destination Deliveries or Performance DLVR SCH REL CD / QUANTITY / PERF COMPL DATE				$ 890,000.00

Name of Offeror or Contractor: OAKLAND UNIVERSITY

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	001 0 SEE SECTION F $ 890,000.00				

SECTION C - DESCRIPTION/SPECIFICATIONS/WORK STATEMENT

SECTION C

C.1 The contractor, as an independent contractor and not as an agent of the Government shall establish a Fastening and Joining research Institute. The research will pursue the advance of science and technology in the general area of fastening and joining threaded fasteners, bolted joints of metals, composites plastics, and other polymers, adhesive bonding, resistance welding and advanced riveting. To satisfy the contract the contractor shall perform the following tasks.

C.2 IMPROVED RELIABILITY OF THE END CONNECTOR JOINT ON THE T158 TRACK

C.2.1 The contractor shall develop a static torque-tension-deformation signature of the T158 track end connector. The contractor shall prepare a test matrix varying the torque applied to the connector in order to obtain reliable measurements of the tension and deformation associated with the various levels.

C.2.1.1 The contractor shall use optical imaging to add a strain/stress signature to the T158 track end connector signature completed in C.2.1.

C.2.2 The contractor shall create a finite element model to simulate the work in C.2.1. This model shall be sufficiently refined such that the computer results correlate with the actual test results.

C.2.3 The contractor shall develop and present, to the Contracting Officers Representative (COR), a test plan to measure the in-service loads on the joint during vehicle operations. Based on the approved test plan the contractor shall instrument the T158 end connector hardware, and after coordination with the COR ship the hardware to YUMA Proving Grounds for government test and evaluation.

C.2.4 The contractor shall use the results obtained in C.2.1, C.2.2 and C.2.3 to perform additional finite element modeling, taking into account the addition of in-service loads. These results and FEA input files (as derived from the development of the FEA model in C.2.2) shall be provided to the COR within 5 months after contract award

C.2.5 The contractor shall develop a test matrix to evaluate the effects of friction forces between the pin and end connector (wedge) interface. The test matrix shall be established such that it takes into account different friction levels as would be seen when operating in different soil conditions.

C.2.6 The contractor shall determine and recommend a minimum (residual) level of fastener tension that would cause sufficient clamping force that prevents the sliding of the joint on the pin. This recommendation will be evaluated by the Government at a test site for effectiveness.

C.2.6.1 The contractor shall identify the desirable range of optical images and use pattern recognition technology in real-time to stop the tightening of the bolt once these images are achieved. The contractor shall correlate the new optical imaging technology to the Finite Element modeling.

C.2.7 The contractor shall prepare and deliver a Standard Operating Procedure (SOP) for use in manufacturing and field operations such that the joint integrity will be maintained with minimal maintenance actions.

C.3 IMPROVING FASTENER DISONNECT ON T158 TRACK PADS

C.3.1 The contractor shall review current literature on existing design specifications, including torque settings and factory and field assembly tools of current T158 track pad fastener. A clear understanding of the environment and abuse the fastener endures is needed.

C.3.2 The contractor shall investigate the advantages and disadvantages of quick-disconnect fasteners for the T158 track pad.

C.3.3 The contractor shall present 5 quick-disconnect fastener concepts to the COR for possible replacement of the current T158 track pad fastener. Up to two of these concepts will be selected by the COR for field testing. The contractor will supply 40 pieces of each chosen concept to the COR.

C.4 FASTENING OF COMPOSITE JOINTS

C.4.1 The contractor shall use a five-spindle electric nut runner to tighten five -20, SAE Grade 8 fasteners on a composite flange simultaneously to 100 ft-lb torque. Each fastener shall be instrumented to indicate its tension via a digital display. A torque-tension relationship will then be recorded and established.

C.4.2 Using a manual digital torque wrench in place of the five-spindle electric nut runner, the contractor shall repeat C.4.1. An influence coefficient matrix will be created and inverted so that uniform clamping force is created in each joint after all

fasteners are tightened.

C.4.3 The contractor shall monitor clamping forces for hard composite joints as well as for gasketed composite joints to determine when relaxation ceases and a steady state is achieved.

C.4.4 The contractor shall submit a final recommendation of fastening order, tension, and pattern along with the information regarding the tension decrease in a fastened joint as subsequent fasteners are tightened.

C.4.5 The contractor shall use a digital torque wrench, multiple-spindle nut-runner, and strain gauged bolts to develop the static torque/tension/deformation/strain/stress signature for a composite joint.

C.4.6 The contractor shall use clamping force optical images correlating to the desired clamping load and use pattern recognition technology to stop the tightening once the images are recognized.

C.4.7 The contractor shall study the effects of drillng bolt holes in a composite by measuring the effects on the joint strength. A summary of the results will be submitted to the COR and included in the final report.

C.4.8 The contractor shall study the effects of service loads on the integrity of the composite joints. A summary of the results will be submitted to the COR and included in the final report.

C.4.9 The contractor shall recommend to the Government proper torque values for production pieces as well as for inspection.

C.5 HEAD VERSUS NUT TORQUE SPECIFICATIONS

C.5.1 The contractor shall determine the torque-tension relationships with particular emphasis on the difference between head tightening and nut tightening. Through testing, a matrix will be constructed for fastener sizes between and (and the metric equivalents), flanged head, standard hex head, flanged nut, standard hex nut, fine thread, coarse thread, various hole clearances, various finishes of the clamped parts, and various levels of friction.

C.5.2 The contractor shall submit recommended tensions for the various fasteners tested and the side from which each should be fastened (bolt side or nut side). Included in this recommendation should be any advantages of tightening one side over the other.

C.6 BOLT TOGETHER FRAMES FOR HEMTT PLATFORM

C.6.1 The contractor shall review the finite element analysis data, provided as Government Furnished Information for the current bolt together HEMTT platform.

C.6.2 The contractor shall perform an overall systems analysis sufficient to recognize all contributing factors of frame torsional rigidity.

C.6.3 The contractor shall perform its own computer modeling and simulations and laboratory testing of bolted assemblies using various tightening strategies. A matrix will be assembled to show the results of these tests and the variations in the results.

C.6.4 The contractor shall recommend and provide a factory manufacturing installation procedure that optimizes frame/cross-member/fastener pattern and type. The manufacturing installation procedure shall be provided to the COR for review and approval. . Recommendations will be provided to the COR on future areas of consideration for improving the HEMTT frame platform.

C.6.5 The contractor shall manufacture joints similar to the bolt-together frames of the HEMTT.

C.6.6 The contractor shall use a digital torque wrench to tighten bolts to a pre-determined load. Analyze the torque-tension relationship. Monitor and analyze the elastic interaction between bolts in the same joint.

C.6.7 The contractor shall compare time/cycles to loosening using the vibration loosening test machine for no less than 3 locking methods. Contractor shall analyze and compare the data.

C.6.8 The contractor shall make recommendations to the COR on ways to reduce loosening due to vibration.

C.7 REAL-TIME CONTROL OF FASTENER TIGHTENING

C.7.1 The contractor shall use ultrasonic wave lengths to determine bolt elongation after a fastener has been tightened. They will develop a device to measure real-time fastener data. Measurements of wave lengths will be conducted while the fastener is being tightened.

C.7.2 The contractor shall relate, and present in matrix form, the wave length to fastener elongation relationship.

C.7.3 The contractor shall develop and deliver to the COR a prototype device, along with documentation explaining the technology, that may be used in manufacturing that stops fastener tightening at a pre-determined value of torque, torque-angle, tension, or wave-length stretch.

C.7.4 The contractor shall develop a test fixture to measure, on the multi-spindle nut-runner, the spindle torque, clamp force, bolt elongation, underhead friction torque, and thread friction torque, as well as the bolt elongation using ultrasonics. Data collected through a multi-channel data acquisition system will be recorded and used to stop the tightening of an individual bolt when it has reached the desired elongation.

C.8 FASTENING AND JOINING SEMINARS AT TACOM

C.8.1 The contractor shall conduct four one-day seminars at TACOM on the latest fastening and joining technologies and methodologies.

C.8.2 The contractor shall provide documentation for up to twenty-five individuals for each seminar.

C.9 PUBLICATIONS

C.9.1 The contractor shall publish a minimum of six journal papers and four conference papers.

C.10 REPORTS AND DRAWINGS

C.10.1 Contractor's Progress Status and Management Report (CDRL A001) shall be submitted bi-monthly. The bi-monthly report shall be in accordance with the format and scope specified in the applicable Data Item Description (DD Form 1664). At a minimum, each report submitted shall address technical progress made during the two month period, problems encountered, and plans for the following two months. All reports shall be furnished to the Government in accordance with the requirements, quantities, and schedules set forth in the Contract Data Requirements List (DD Form 1423and in accordance with the DID DI-MGMT-80227(T)).

C.10.2 The Contractor shall prepare/mark-up drawings and technical data in the format and scope specified in the applicable Data Item Description (DI-SESS-81002B). This information shall be furnished to the Government in accordance with the requirements, quantities, and schedules set forth in Contract Data Requirements List (DD Form 1423 A004).

C.10.3 The contractor shall submit a final technical report in accordance with CDRL A002 and DID DI-MISC-80711A(T) at the conclusion of the program. The Draft Final Report shall be submitted within forty-five (45) days after completion of all technical work under the contract (13 months and two weeks after award). The government shall review the Draft Final Report within thirty (30) days and return it to the Contractor for changes/corrections. The final Technical Report, in published format, shall be submitted within fifteen days after Government approval of the Draft Final Report.

C.11 MEETINGS

C.11.1 A program start meeting will be held at TACOM within 30 days of the contract award date

C.11.2 Bi-monthly meetings will be held at the contractors facility so the status of the projects can be seen.

C.11.3 A program end meeting will be held at TACOM upon program completion.

*** END OF NARRATIVE C 001 ***

SECTION F - DELIVERIES OR PERFORMANCE
DELIVERIES OR PERFORMANCE

F.1 Period of Performance

F.1.1 The period of performance for this effort shall be from date of contract award through l5 Feb 06.

F.2 Deliveries / Shipping

F.2.1 All technical data (reports) covered by this contract which have not been previously delivered shall be subject to electronic delivery to the Government upon completion or termination of this contract. All technical data/drawings to be delivered pursuant to this contract, shall contain all COTR approved changes.

F.2.2 All technical data (reports) specified for delivery under this contract or any subcontract hereunder shall be provided in accordance with the " Rights in Technical Data" clause set forth in this contract. No other clauses, directives, standards, specifications or other implementation shall be deemed directly or by reference to enlarge or diminish such rights.

F.2.3 The contractor shall be responsible for shipping all hardware and technical data (not in electronic format) F.O.B. Destination to the following address:

Commander
U.S. Army Tank-automotive and Armaments Command
ATTN: Kevin Centeck
AMSTA-TR-R, MS159
Warren, MI 48397-5000

*** END OF NARRATIVE F 001 ***

Name of Offeror or Contractor: OAKLAND UNIVERSITY

SECTION G - CONTRACT ADMINISTRATION DATA

LINE ITEM	PRON/ AMS CD/ MIPR	ACRN	OBLG STAT/ JOB ORD NO	PRIOR AMOUNT	INCREASE/DECREASE AMOUNT	CUMULATIVE AMOUNT
0001AB	E132C501EH	AB	2	$ 0.00	$ 890,000.00	$ 890,000.00
	10601103D8Z		32C501			
				NET CHANGE	$ 890,000.00	

SERVICE NAME	NET CHANGE BY ACRN	ACCOUNTING CLASSIFICATION		ACCOUNTING STATION	INCREASE/DECREASE AMOUNT
Army	AB	97 30400110136D7675P106011255Y	S20113	W56HZV	$ 890,000.00
				NET CHANGE	$ 890,000.00

	PRIOR AMOUNT OF AWARD	INCREASE/DECREASE AMOUNT	CUMULATIVE OBLIG AMT
NET CHANGE FOR AWARD:	$ 1,040,000.00	$ 890,000.00	$ 1,930,000.00